FRDA REPORT 120

DEMONSTRATION OF GROWTH AND FORM OF YOUNG COASTAL CONIFERS IN THE CWHb1 VARIANT

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SUMMARY

Tenth season measurements of a five-species demonstration at Nahmint Lake, on central Vancouver Island, indicated that differences in height and volume growth were evident. Growth differences at age 10 were two-fold for height and five-fold for volume between the slowest and fastest growing species. In decreasing rank order, Douglas-fir was followed by western hemlock, western redcedar, and the true firs. Stem form problems were not prevalent on this site.

ACKNOWLEDGEMENTS

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This report could not have been done without the quality assessment and documentation by MB staff, namely J.B. Loucks, M.K. Hooper, D.R. Clark, and especially, E.M. Steele.

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1.0 INTRODUCTION

Quantitative comparisons of recommended species are essential to validation and improvement of species allocation on the coast. The current species allocation guide for coastal British Columbia is based primarily on ecological principles and presence or absence of species in old-growth forest ecosystems (Klinka et al. 1984). This provides a reasonable basis for hypothetical species selection (Figures 1 and 2). However, these hypotheses need to be tested.

Requirements for developing a quantitative database for species comparisons in plantations are:

- long-term installations,
- species established in large blocks, and
- uniform and definable site types.

Measurements should be started prior to canopy closure and carried through to mid-rotation.

This type of work has been recently conducted under the Forest Resource Development Agreement (FRDA) by S. Omule and G. Krumlik on 26-year-old plots established by J. Heatherington in the CWHb1 biogeoclimatic association (Omule and Krumlik 1987). The project reported here is a demonstration of similar species, at eleven years of age, on a high productivity site in the CWHb1, near Port Alberni.

2.0 STUDY AREA AND DESIGN

The site is located 2 km east of Nahmint Lake, approximately 30 minutes south of Port Alberni (Figures 3 to 5). Table 1 presents the site's ecological association, soil description and the current recommended species.

TABLE 1. SITE LOCATION AND DESCRIPTION

BGC Association	CWHb1, Site Unit 4/6
Elevation	150 m
Soil Texture/Depth	SiCL/ > 1 m
Site Index	34 m to 35 m @ 50 yr
Annual Precipitation	3 m (17% to 22% during growing season)
Recommended Species	Hw, Cw, Ss, Ba, Df

Grid No. 9

Recommended tree species for the:

CWHb1	WINDWARD SUBMONTANE MARITIME WETTER CWH VARIANT

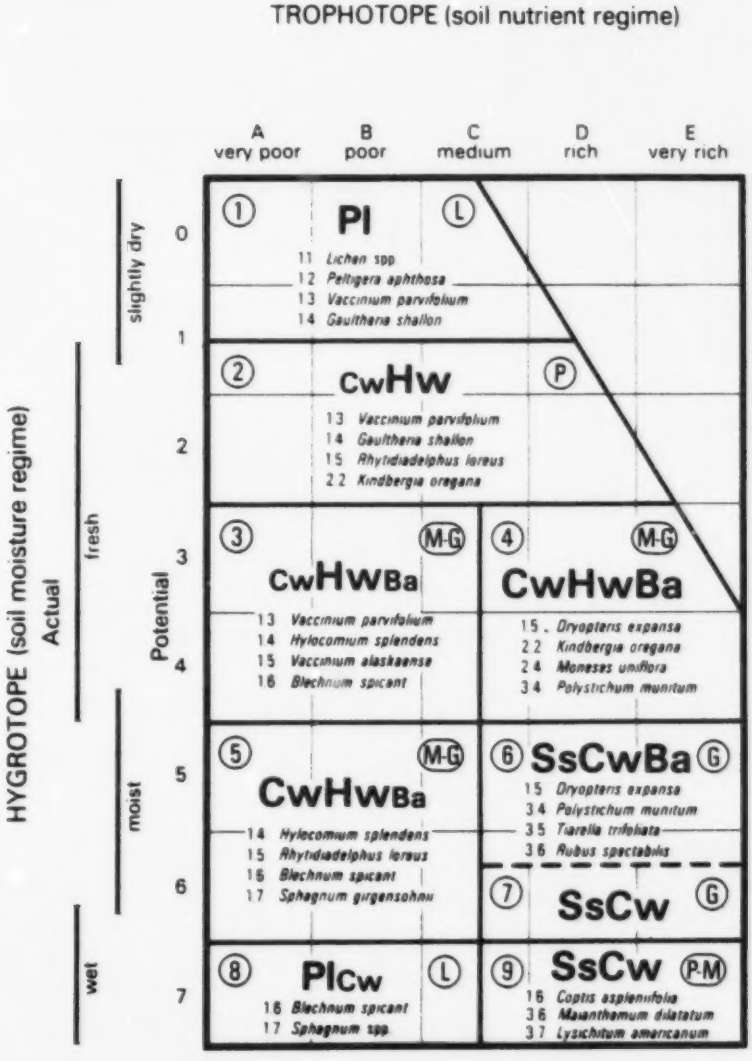

FIGURE 1: SPECIES ALLOCATION GUIDE AND RECOMMENDATIONS FOR CWHb1 (Klinka et al. 1984)

Comments on the Recommended Tree Species for the Windward Submontane Maritime Wetter CWH Variant (CWHb1) - Grid No. 9.

GENERAL COMMENTS

1. The application of Fd should be restricted to the southern part of the variant (south of Brooks Peninsula or Seymour Inlet) and based on some evidence of its presence in the local area.

2. There is potential for widespread application of Ss on nutrient-medium to very rich sites in the northern part of the variant (north of Brooks Peninsula or Seymour Inlet).

3. *Gaultheria shallon* replaces *Hylocomium splendens* as representative species for EISG 1.4 in Site Units 3 and 5 on western and northern Vancouver Island.

SPECIFIC COMMENTS

Site	Comment
1.	Marginal sites for timber production; Fd is an alternative to Pl.
2.	Fd is an alternative to Hw; Ss is an acceptable minor species on nutrient-medium sites.
3.	Ss is an acceptable major species on nutrient-medium sites.
4.	Fd or Ss are alternatives to Hw.
5.	Ss is an acceptable minor species on nutrient-medium sites; the distribution of Hw should be related to acid organic mounds.
6.	Brush hazard sites; establishment of a mixed-species stand is desirable; Ba is an alternative to Ss or Cw; Cw is preferable on steep slopes; Hw is an acceptable minor species.
7.	Alluvial floodplains; high brush hazard sites; establishment of a mixed-species-stand is desirable; the application of Ac as an alternative to coniferous species should be based on some evidence of its presence in the local area.
8.	Marginal sites for timber production.
9.	Brush hazard sites; Hw is an acceptable minor species, depending on the frequency of acid organic mounds on the site.

FIGURE 2: SPECIES ALLOCATION GUIDE AND RECOMMENDATIONS FOR CWHb1 (Klinka et al. 1984)

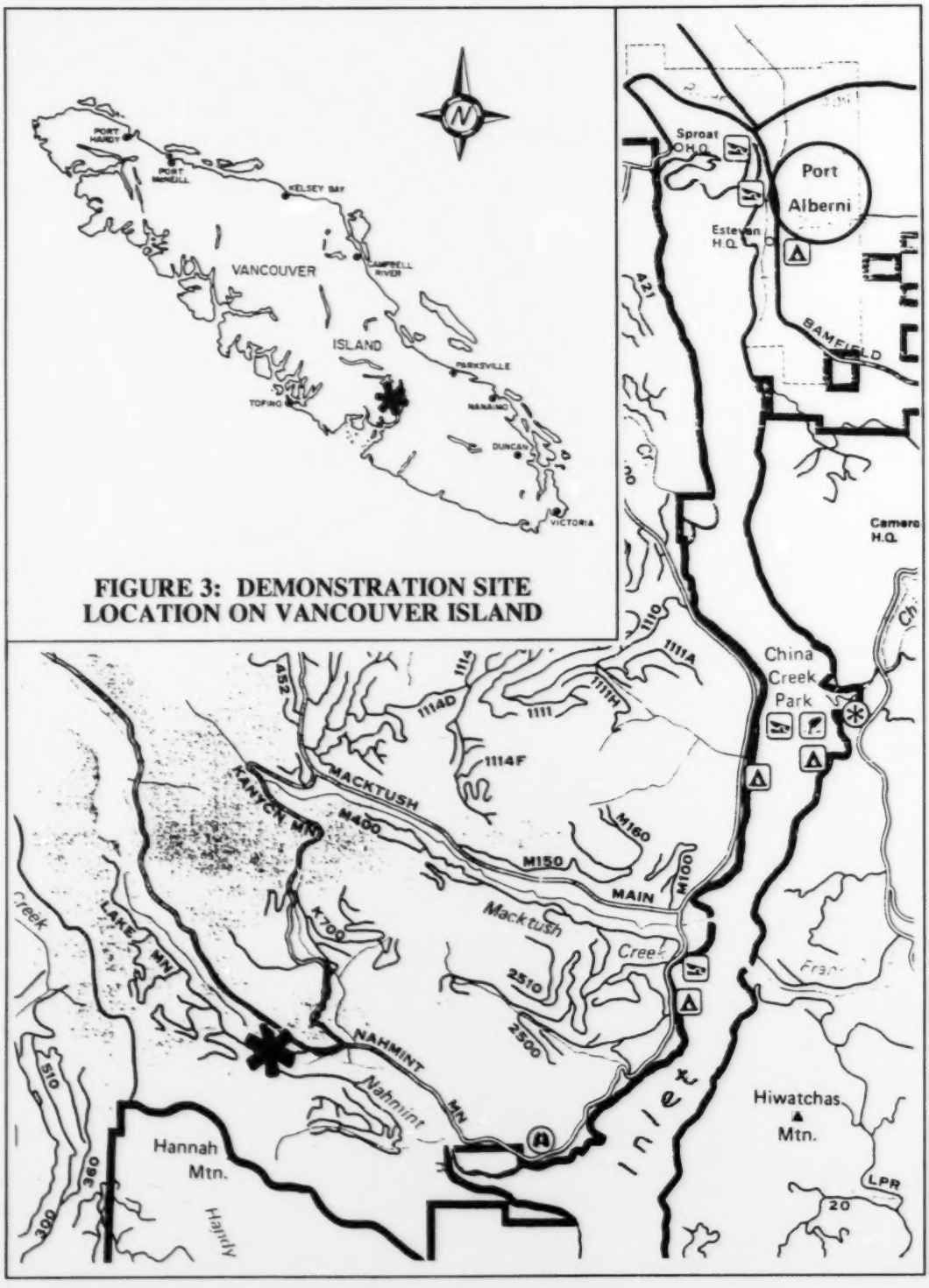

FIGURE 3: DEMONSTRATION SITE LOCATION ON VANCOUVER ISLAND

FIGURE 4: DEMONSTRATION SITE LOCATION NEAR PORT ALBERNI

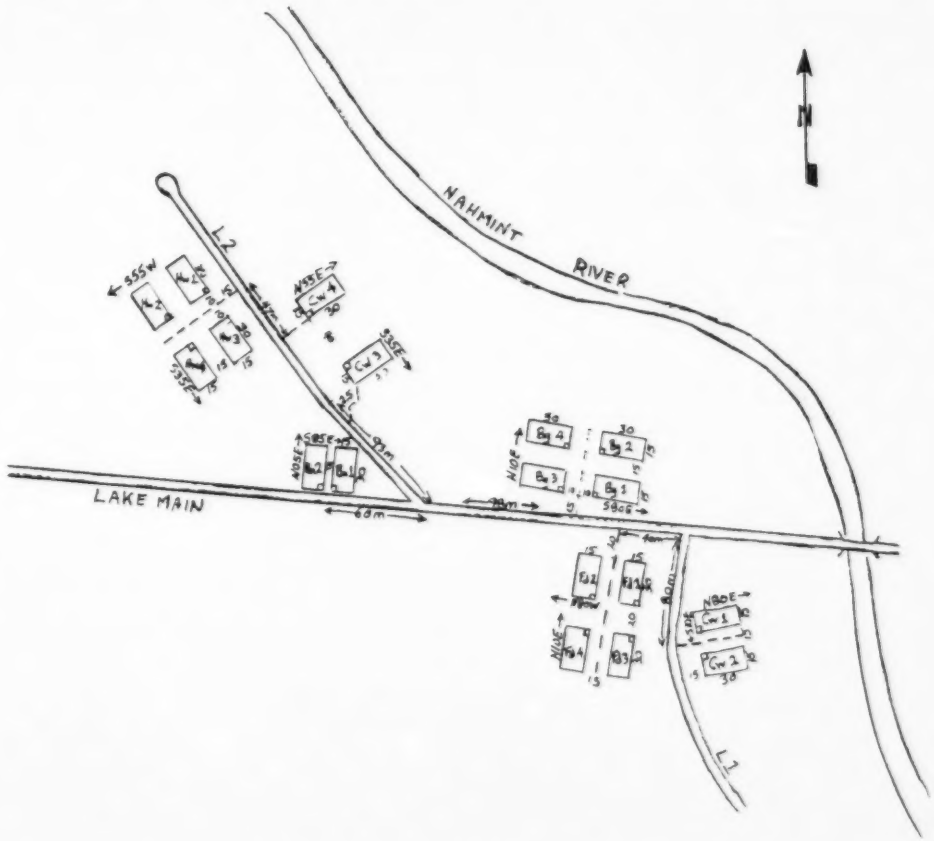

FIGURE 5: DEMONSTRATION SITE LAYOUT MAP SHOWING SPECIES BLOCK LOCATIONS

3.0 LOGGING AND PLANTING HISTORY

The site was logged and broadcast burned in 1977/78. Five species were planted in 1979/80 in large (>5.0 ha blocks) at 3 m x 3 m spacing, on the most uniform portion of the site (Table 2).

TABLE 2. SPECIES AND STOCKTYPES PLANTED AND NUMBERS OF TREES ASSESSED

Species	Stocktype	# Trees Assessed
Cw	2+1 Bareroot	190
Hw	1+0 PSB 313	203
Ba	1+2 Bareroot	92
Bg	2+0 Bareroot	151
Df	2+1 Bareroot	218

In 1987, four 0.045 ha plots were established in each of the original blocks, with the exception of the Pacific silver fir block which would only accommodate two plots.

All trees were assessed in 1987 and 1989 for height, basal caliper, diameter at breast height, stem form and pathological indicators.

In addition, in 1987 ten dominant trees from outside the Pacific silver fir, grand fir and Douglas-fir plots were destructively sampled to determine back heights and ages.

4.0 RESULTS

4.1 Growth

The height and volume growth comparisons among species indicate that the tallest and shortest species were Douglas-fir and Pacific silver fir, respectively. Height at ten years ranged from 6.5 to 3.2 m (Figure 6 and Table 3). This translates into an approximate four to five-year delay between the fastest and slowest growing species.

TABLE 3. SPECIES AVERAGE HEIGHT AND VOLUME AT TEN YEARS (standard deviations in parentheses)

Species	Height at 10 years (m)	Volume at 10 years (dm^3)
Fd	6.4 (1.1)	43 (18.0)
Hw	4.8 (1.4)	18 (11.0)
Cw	4.4 (1.2)	15 (10.0)
Bg	3.7 (1.2)	12 (8.0)
Ba	3.3 (0.7)	8 (5.0)

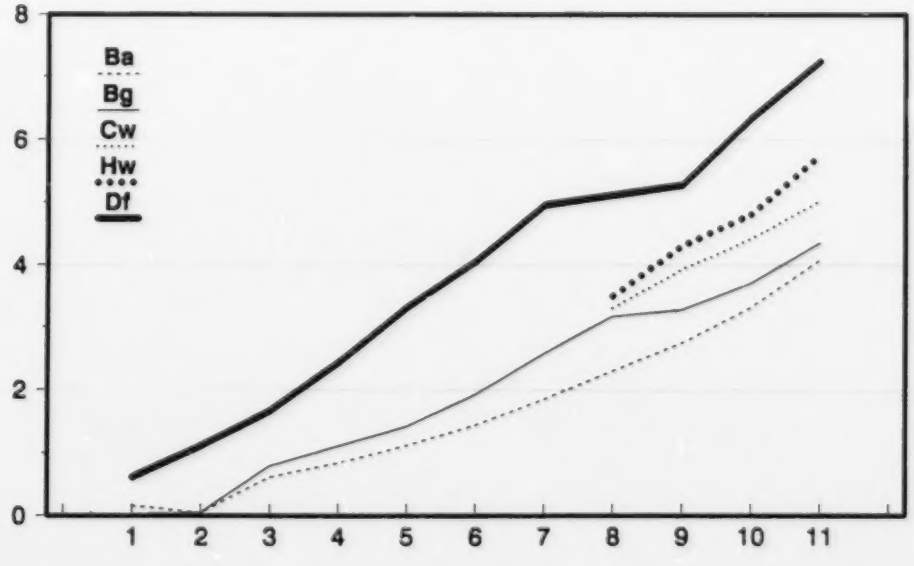

FIGURE 6: HEIGHT DEVELOPMENT (m) OVER THE FIRST ELEVEN YEARS FOR ALL FIVE SPECIES

There was a two-fold difference in height and a five-fold difference in volume at age ten between the fastest and slowest growing species (Figures 7 and 8).

The heights are similar to those derived from Omule and Krumlik (1987) for Site Unit 4 and slightly under those developed for Site Unit 6.

Species ranking by height and volume were consistent with Omule and Krumlik (1987): Douglas-fir, western hemlock, western redcedar, grand fir, and Pacific silver fir.

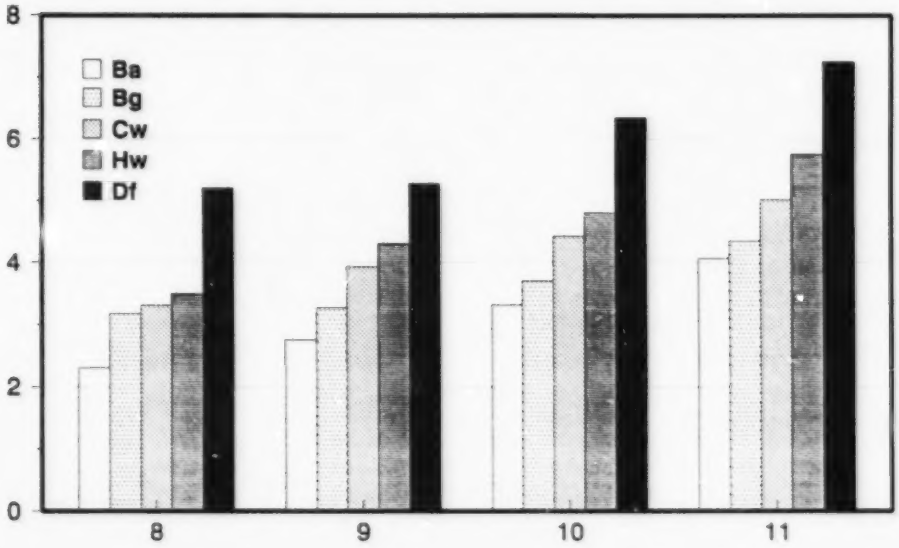

FIGURE 7: HEIGHT (m) FOR ALL FIVE SPECIES DURING THE LAST FOUR YEARS

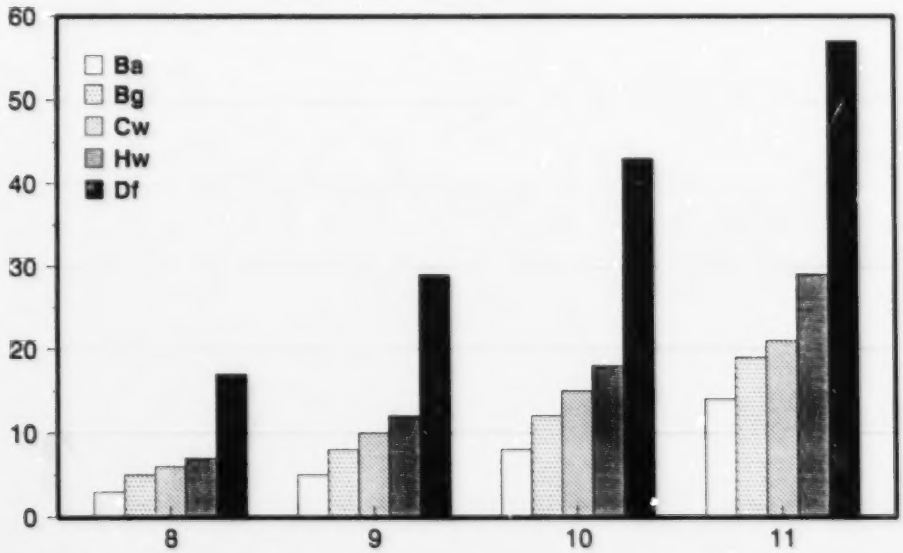

FIGURE 8: VOLUME (dm^3) FOR ALL FIVE SPECIES DURING THE LAST FOUR YEARS

4.2 Form and Pathology

The most severe problem with form on the species observed was multiple tops. This was a considerable problem with western redcedar (80%) and, to a lesser degree western hemlock (30%). This could have resulted from frost damage, browsing or both. Most of the multiple tops originate near the base of the stem indicating that the damage occurred early in the plantations life.

Form problems were not evident in Douglas-fir in terms of sinuosity or snow damage. However, this species tended to have branchier crowns and more severe branch angles than any other species. The true fir species had good, straight form and no snow damage.

The only pathological problem was the presence of *Armillaria ostoyea* with grand fir. Grand fir is still showing signs of chlorosis and some mortality. The mortality has been confirmed to be associated with *Armillaria*. This may be an indication that grand fir is under stress and may be considered off site.

5.0 CONCLUSIONS

The results of this demonstration suggest that, in terms of rapid early growth, the species of choice on CWHb1 is Douglas-fir. This species out-performed all species on the Nahmint site (Site Unit 4). In decreasing rank order, Douglas-fir was followed by western hemlock, western redcedar and Pacific silver fir. Grand fir has growth similar to Pacific silver fir, but has been attacked by *Armillaria ostoyea*.

Differences in juvenile height and volume growth are evident at ten years of age. Growth differences at age 10 are approximately two-fold for height and five-fold for volume between the slowest and fastest growing species. These results confirm recent observations on similar site units in this variant.

Stem form problems were not prevalent over all the species tested. The most persistent form problem was multiple tops. This was concentrated in cedar and hemlock and likely resulted from early frost damage or browsing. Form problems have been evident with Douglas-fir on some units in this variant. Therefore, these results may only be site specific.

6.0 LITERATURE CITED

Klinka, K., R.N. Green, P.J. Courtin and F.C. Nuszdorfer. 1984. Site diagnosis, tree species selection and slashburning guidelines for the Vancouver Forest Region. B.C. Ministry of Forests, Land Management Report 25. 180 pp.

Omule, S.A.Y. and G. Krumlik. 1987. Juvenile height growth of four species on four sites in the CWHb1 variant. FRDA Report 007. 15 pp.

ERRATA
June 29, 1990

(Changes are shown in **bold type**)

CONCERNING: *Demonstration of growth and form of young coastal conifers in the CWHb1 variant.* B.G. Dunsworth. 8 pp. April 1990.

Page 1, Section 1.0, Paragraph 1 should read:

Quantitative comparisons of recommended species are essential to validation and improvement of species allocation on the coast. The current species allocation guide for coastal British Columbia is based primarily on ecological principles and presence or absence of species in old-growth forest ecosystems **and earlier successional stages** (Klinka et al. 1984). This provides a reasonable basis for hypothetical species selection (Figures 1 and 2). However, these hypotheses need to be tested.

Page 1, Section 1.0, Paragraph 4 should read:

This type of work has been recently conducted under the Forest Resource Development Agreement (FRDA) by S. Omule and G. Krumlik on 26-year-old plots established by J. Heatherington in the CWHb1 biogeoclimatic **variant** (Omule and Krumlik 1987). The project reported here is a demonstration of similar species, at eleven years of age, on a high productivity site in the **windward, submontane, maritime, wetter CWH variant (CWHb1),** near Port Alberni.

Page 1, Section 2.0, Table 1 should read:

BGC Classification	CWHb1, Site **Unit 4**
Elevation	150 m
Soil Texture/Depth	SiCL/>1 m
Site Index	34 m to 35 m @ 50 yr
Annual Precipitation	3 m (17% to 22% during growing season)
Recommended Species	Hw, Cw, Ss, Ba, Fd

Page 5, Section 3.0, Paragraph 1 should read:

The site was logged and broadcast burned in 1977/78. Five species were planted **(by MB foresters M. Geisler and C. van Oosten)** in 1979/80 in large (>5.0 ha blocks) at 3 m x 3 m spacing, on the most uniform portion of the site (Table 2).

Page 8, Section 5.0, Paragraph 1 was split into two, and should read:

The results of this demonstration suggest that, in terms of rapid early growth, the species of choice on **Site Unit 4, in the southern half of the CWHb1 variant,** is Douglas-fir. **Due to the location of this site on the warmer, eastern edge of the CWHb1 variant, caution should be used in extrapolating these results to similar site units throughout the variant.**

In decreasing rank order, Douglas-fir was followed by western hemlock, western redcedar and Pacific silver fir. Grand fir has growth similar to Pacific silver fir, but has been attacked by *Armillaria ostoyea.*